DIPLOMA IN AEROSPACE ENGINEERING

Growing up, were you fascinated with how a heavy machine can fly? Do you ever imagine yourself designing and handling the next generation of aircraft? Do you find yourself interested in aviation news? Then come on board the Diploma in Aerospace Engineering (AEG).

In AEG, you will gain a strong engineering foundation with a focus on major aerospace disciplines. In your first semester, we will strengthen your engineering knowledge with modules such as Engineering Mathematics, Mechanical Engineering Fundamentals and Electrical Engineering Fundamentals to prepare you for the core aerospace modules in the later semesters.

At the end of your first semester, you can pick one of our two specialisation options (Avionics or Mechanical) that will build on your engineering foundation and areas of interest.
Throughout your three years, there will be opportunities for you to apply your engineering knowledge and design skills through an integrated real-world project every semester.
With our strong emphasis on design thinking in the integrated real-world projects, you will be well prepared for any challenges and jobs in the future.

Then in your final year, put your knowledge to the test with a six-month local or overseas internship with companies such as Airbus Helicopters, Collins Aerospace, Pratt & Whitney, Scoot, ST Engineering and Thales Solutions Asia. Students who are interested to get their Private Pilot Licence (PPL) can choose to participate in the Singapore Youth Flying Club PPL Course as their internship.

SPECIALISATION OPTIONS

Avionics
You will get to study the principles of flight and the various sophisticated systems on an aircraft, such as navigation, surveillance, communication and electrical systems.

Mechanical
You will learn the fundamentals of engineering system design, aircraft structures and materials, applied thermofluids as well as aircraft maintenance practices.

YEAR 1 COURSE MODULES

LEVEL 1.1

COMMON MODULES

Electrical Engineering Fundamentals
This module provides a foundation in electricity covering basic concepts of electrical circuits and the methods used to analyse them. The module emphasises the understanding of the basic electrical circuit laws (Ohm's Law, Kirchhoff's Voltage and Current Laws) and network theorems, and their application to electrical network analysis. Topics covered include fundamentals of electricity, network theorems, capacitance, electromagnetic induction and inductance.

Engineering Mathematics 1
This module is designed to provide students with the fundamental skills in mathematics required to solve basic engineering problems. Topics are introduced in an order that is intended to keep abreast of the application requirements in engineering modules. The emphasis in each topic is on simple applications and problem solving. Topics include algebra, trigonometry, logarithms, plane analytic geometry, matrices and complex numbers. Throughout the module, there is appropriate use of a Computer Algebra System.

Integrated Real-world Project 1
This module aims to integrate the knowledge learnt in the semester and apply it to a real-world project to understand its relevance. Students will work in teams and undertake the project development underpinned by the design thinking approach. On completion of the module, students will be able to apply the skills and develop confidence in tackling projects. Data analytics will be introduced using case-based approach and applied in the integrated real-world project.

Mechanical Engineering Fundamentals
This module introduces students to the study of external forces in two dimensions and their effect on particles and rigid bodies that are at rest. Students learn the skills to analyse the forces acting on the bodies by drawing free-body diagrams and applying the conditions of equilibrium. Topics include forces and resultants, moments and couples, equilibrium and the concepts of plane friction. This module also aims to equip students with the skills to analyse problems of rigid bodies in motion. Only linear motion in two dimensions will be covered. Topics include kinematics and kinetics of linear motion

Programming
This practice-oriented module equips students with basic knowledge and skills in computer programming using a suitable high-level language. The main topics include basic computer programming concepts and fundamental programming constructs such as sequences, selection and repetition

LEVEL 1.2

COMMON MODULES

Engineering Mathematics 2
This module is designed to provide students with the fundamental skills in mathematics required to solve basic engineering problems. Topics are introduced in an order that is intended to keep abreast of the application requirements in engineering modules. The emphasis in each topic is on simple applications and problem solving. Throughout the module, there is appropriate use of a Computer Algebra System. Topics include trigonometry, differentiation and simple integration with applications.

Integrated Real-world Project 2
This module aims to integrate the knowledge learnt in the semester and apply to a real-world project and understand the relevance and application of the modules learnt. Students will work in teams and undertake the project development underpinned by the design thinking approach. On completion of the module, students will be able to apply the skills and develop confidence in tackling projects at the higher levels.

AVIONICS SPECIALISATION OPTION

AC Circuits
This module provides students with basic knowledge of the fundamental principles in electric circuit analysis. The module extends DC network theorems to AC circuits which involve impedances such as capacitance and inductance. The module also includes analysis of simple AC series, parallel and series-parallel combination circuits, concept of AC power and understanding of power factor and its effect on electrical energy usage.

Analogue Electronics
The aim of this module is to lay the foundations in analogue electronics. At the end of this module, students will acquire content knowledge and understanding on the basic concepts of analogue electronics and some applications. Key topics covered in this module include operating characteristics, working principles and applications of discrete electronic devices such as various types of diodes, MOSFETs and BJTs. Practical circuits will be used to enhance and strengthen the learners' knowledge so that they will acquire the relevant competencies to move on to more specialized modules.

Digital Fundamentals
This module introduces the basic concepts of digital systems. It covers the basics of combinational and sequential logic circuits. Flip-flops and their application in counters and registers will also be discussed. This basic knowledge is essential for students to be able to understand, analyse, and design basic digital circuit system.

MECHANICAL SPECIALISATION OPTION

Electrical & Electronic Technology
The aim of this module is to introduce the fundamental concepts of digital electronic devices and circuits. It intends to deepen the electrical fundamentals learnt in the first semester. Topics include AC circuit theory and transformer fundamentals, number systems, Boolean algebra, combinational logic design, applications of latches, flip-flops, counters and registers.

Materials & Manufacturing Technology
This module introduces students to properties of common engineering materials with emphasis on mechanical testing methods, heat-treatment, international standard specifications, and selection and applications of such materials. Topics include classification of materials, mechanical testing, alloying, steels, non-ferrous alloys, plastics, ceramics and composites. For manufacturing technology, students will acquire the basic knowledge and skills of manufacturing processes, including drilling, turning, milling, grinding, non-conventional machining, welding and assembly.

Thermofluids
Students will learn the basic laws governing the behaviour of fluids under the influence of energy transfer. Topics include systems concept, temperature and pressure, fluid statics, fluid in motion, continuity equation, laminar and turbulent flows, ideal incompressible flow, Bernoulli's equation, flow measurement and Pitot tube, external flow and application of thermofluid's principles in simple engineering systems.

YEAR 1 COURSE CURRICULUM

Module Name	Credit Units
Level 1.1 (20 hours per week)	
Electrical Engineering Fundamentals	3
Engineering Mathematics 1	4
English Language Express*	NA
Innovation Made Possible^	3
Integrated Real-world Project 1	4
Mechanical Engineering Fundamentals	3
Programming	3
Level 1.2 (21 hours per week)	
Avionics Specialisation Option	
AC Circuits	3
Analogue Electronics	3
Communication Essentials^	3
Digital Fundamentals	3
Engineering Mathematics 2	4
Health & Wellness^	1
Integrated Real-world Project 2	4
Mechanical Specialisation Option	
Communication Essentials^	3
Electrical & Electronics Technology	3
Engineering Mathematics 2	4
Health & Wellness^	1
Integrated Real-world Project 2	4
Materials & Manufacturing Technology	3
Thermofluids	3

Notes:

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* This module is only offered to students who are weaker in the English Language.

IS Modules

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YEAR 2 COURSE MODULES

LEVEL 2.1

COMMON MODULES

Aerospace Fundamentals
This module consists of two components: Aircraft Aerodynamics and Aircraft Avionics. It provides students with an understanding of the underlying principles of flight and the aircraft avionics systems of a modern aircraft. Based on the requirements of SAR 66 licence, the module includes topics such as Aerodynamics, Cockpit's Flight & Engine Instruments and Avionics Systems. Students will learn how the principles of air pressure and gyroscopic motion are applied to the flight instruments, and how technologies are shaping the aerospace industry.

AVIONICS SPECIALISATION OPTION

Human Factors & Aviation Legislation
This module is intended to provide an introduction to human factors and aviation legislation for students who may be working in the aviation industry. The module and assessment expand upon the syllabus items listed in the Module 9 and 10 of CAAS SAR-66 requirement. In addition to class test, the assessments also include individual reading assignments and a case study.

Integrated Real-world Project 3
This module aims to integrate the knowledge learnt in the semester and apply to a real-world project and understand the relevance and application of the modules learnt. Students will work in teams and undertake the project development focusing on fight instruments design, analysis and integration. On completion of the module, students will be able to apply the principles of aircraft navigation, communication, surveillance, lighting electronics and data analytics.

Materials & Manufacturing Technology
This module introduces students to properties of common engineering materials with emphasis on mechanical testing methods, heat-treatment, international standard specifications, and selection and applications of such materials. Topics include classification of materials, mechanical testing, alloying, steels, non-ferrous alloys, plastics, ceramics and composites. For manufacturing technology, students will acquire the basic knowledge and skills of manufacturing processes, including drilling, turning, milling, grinding, non-conventional machining, welding and assembly.

Object-oriented Programming
This module introduces object-oriented programming to students who already have a foundation in procedural programming. It covers the fundamental concepts of object-oriented programming with introduction to basic web and database applications.

MECHANICAL SPECIALISATION OPTION

Aircraft Maintenance Practices
The aim of this module is to provide the students with sufficient foundational understanding of aircraft maintenance practices for them to move on to the next stage of aircraft systems and propulsion system learning. This module will cover operations aspect of aircraft flight-line safety and maintenance practices, as well as servicing, inspection and documentation requirements are discussed.

Applied Mechanics
This is a follow-on module from Mechanical Engineering Fundamentals. It will equip students with the necessary skills to analyse problems of rigid bodies at rest and in motion. Topics include trusses, friction, work energy method, power and efficiency and impulse momentum method. This knowledge plays an important role in many diverse engineering

applications in the modern world, such as the design of cars, structures, airplanes, and various types of machines. Students will be guided to solve engineering problems using these mechanics principles.

Engineering System Design
It is the intention of this module to equip students with the fundamental knowledge and practice of proper engineering design process and the applications of engineering principles and analysis in the design, sizing and selection of components such as electric motor, coupling, gears, bearing, chain drives, and fastener. This module will also introduce basic Geometrical Dimensioning & Tolerance (GD&T) to the students. Case studies of existing machines and systems, guided tutorials, quizzes, assignments and a practical project will be used to reinforce the theoretical aspects.

Integrated Real-world Project 3
This module aims to integrate the knowledge learnt in the semester and apply to a real-world project and understand the relevance and application of the modules learnt. Students will work in teams and undertake the project to design and build a component of an aircraft system. On completion of the module, students will be able to apply the knowledge acquired with hand-skills of using of aircraft maintenance tools, hand tools, to build the component.

LEVEL 2.2

AVIONICS SPECIALISATION OPTION

Applied Analogue Electronics
This module covers the fundamentals of analogue electronic circuit design and applications. The operating principles and design of commonly used analogue devices and operational amplifier circuits are taught in this module. The main topics include various types of amplifiers, comparators and filters. Applications in various practical circuits are also illustrated in this module.

Applied Digital Electronics
This module reinforces the concepts learned in Digital Fundamentals through hands on with real digital circuitries. Key digital building blocks like frequency dividers, multiplexer, de-multiplexer and decoder will be introduced. Basic Integrated Circuit Technologies will also be covered. Students will learn to build and troubleshoot basic digital circuit system.

Communication Systems
This module covers the fundamentals of analogue communication principles. Key topics covered in this module include components of a basic communication system, and factors that affect communication performance. The techniques of modulation and demodulation will be explained to allow students to understand and relate important concepts, including signal representation, performance measurements and system applications.

Integrated Real-world Project 4
This module aims to integrate the knowledge learnt in the semester and apply to a real-world project and understand the relevance and application of the modules learnt. Students will work in teams and undertake the project development focusing on aircraft maintenance. On completion of the module, students will be able to apply the skills of using aircraft maintenance tools, hand tools and handling aircrafts safely.

Principles & Applications of Aircraft Science
This module provides students with an understanding of the underlying principles of aircraft engineering systems. Students will learn about aircraft structural stress and strain, thermodynamic principles of propulsion engine, kinetic and dynamic principles involving aircraft circular motion and maneuvers, and fluid principles concerned with external and internal fluid flows over aerofoil surfaces, and flow through ducts and piped systems, based on the requirements of SAR 66 licence.

MECHANICAL SPECIALISATION OPTION

Aircraft Structures & Materials
The module introduces students to the properties and processes for aerospace materials: aluminum, magnesium, titanium and nickel-based systems including super alloys, advanced aircraft materials like ceramics and composites. The module also covers basic construction and design characteristics of aircraft structures like fuselage, wings, flight controls, empennage, and landing gear. Students are to understand the principles guiding the design/selection of materials and processes in the fabrication/maintenance of generic aircraft structures.

Applied Thermofluids
Thermo-fluids is a module of science and engineering encompassing 2 intersecting fields namely Thermodynamics and Fluid mechanics. In relation to mechanical engineering, Thermodynamics is the science of converting energy involving heat to mechanical work and Fluid Mechanics is the study of physical forces in a system in the presence of fluid when at rest or in motion. Heat energy had to be transported by fluid in order to undergo various thermodynamic processes and becomes mechanical work eventually. The way fluid would flow ultimately dominates the entire thermal energy conversion process.

This module extends the coverage of Thermofluids in year 1, which further the basic concepts and principles of Thermodynamics and Fluid mechanics concepts. Behaviour of fluids under different conditions like static, dynamic and under the influence of heat will be covered in further details. The most important 2nd law of Thermodynamics will be introduced. Subsequently, Basic Engineering cycles developed from the 2nd law including Steam power cycles and Gas power cycles will be discussed. Students will also be taught on the methods of Engine performance testing.

Integrated Real-world Project 4
This module aims to integrate the knowledge learnt in the semester and apply to a real-world project and understand the relevance and application of the modules learnt. Students will work in teams and undertake the project development underpinned by the design thinking approach. On completion of the module, students will be able to apply the skills to design and build a remote-controlled fixed wing aircraft with the capability to achieve certain mission.

Quality Systems & Analytics
This module prepares students to apply quality system management techniques and principles in their future workplace. Topics include Quality Systems and Audits, quality tools and techniques including the application of statistical software for process control, Gage Repeatability and Reproducibility, Hypothesis Testing, Design of Experiments, Statistical Process Control, and Mistake Proofing to optimize and improve products and processes. Process Capability Analysis, Lean Manufacturing for waste elimination and Six Sigma initiatives for defect reduction will also be discussed.

Strength of Materials
This module aims to provide students with the foundational knowledge of strength of materials with emphasis on applications and problem solving. It introduces to students the methods in the calculation of stresses and strains in various structural members such as beams, columns and shafts. Taking into account the material properties, students would then be able to apply the methods to predict the response of a structure under loading. Topics include simple stresses and strains, torsion in shaft, shear force and bending moment diagrams, stresses in beams, combined stresses and experimental stress analysis.

YEAR 2 COURSE CURRICULUM

Module Name	Credit Units
Level 2.1 (18 hours per week)	
Avionics Specialisation Option	
Aerospace Fundamentals	4
Human Factors & Aviation Legislation	2
Integrated Real-world Project 3	4
Materials & Manufacturing Technology	3
Object-oriented Web Programming	5
Mechanical Specialisation Option	
Aerospace Fundamentals	4
Aircraft Maintenance Practices	3
Applied Mechanics	4
Engineering System Design	3
Integrated Real-world Project 3	4
Level 2.2 (20 hours per week)	
Avionics Specialisation Option	
Applied Analogue Electronics	4
Applied Digital Electronics	3
Communication System	4
Integrated Real-world Project 4	4
Principles & Applications of Aircraft Science	3
World Issues - A Singapore Perspective^	2
Mechanical Specialisation Option	
Aircraft Structures & Materials	3
Applied Thermofluids	4
Integrated Real-world Project 4	4
Quality Systems & Analytics	3
Strength of Materials	4
World Issues - A Singapore Perspective^	2

Notes:

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IS Modules

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YEAR 3 COURSE MODULES

LEVEL 3.1

AVIONICS SPECIALISATION OPTION

Aircraft Electrical & Instrumentation Systems
The aim of this module is to introduce the fundamental concepts avionic interfacing techniques, electrical power systems and distribution, wiring practices and installations, and fundamentals of flight control as part of our efforts to meet the CAAS SAR-66 requirements of obtaining a license as a Licensed Aircraft Engineer. It also covers aspects of in-flight entertainment and other sub-systems to meeting the aforesaid requirements. The module will endeavor to bridge the gap between class room learning and actual working with the systems on an aircraft through hands-on laboratory work.

Aircraft Navigation & Surveillance Systems
This module introduces the theory of operations and functional descriptions of airborne navigation and surveillance systems. At the end of the module, students will acquire content knowledge and understanding of a range of air navigation and surveillance systems deployed on the commercial and general aviation aircraft. Key topics in this module include ADF, VOR, DME, ILS and MLS, Radar, ELT, TCAS, INS and GPS and avionics digital data-bus standards.

Integrated Real-world Project 5
This module aims to integrate the knowledge learnt in the semester and apply to a real-world project and understand the relevance and application of the modules learnt. Students will work in teams and undertake the project development focusing on avionic system design, analysis and integration. On completion of the module, students will be able to apply the principles of flight control, avionic instruments, closed loop control system, PID Controllers and data analytics.

Quality Systems & Analytics
This module prepares students to apply quality system management techniques and principles in their future workplace. Topics include Quality Systems and Audits, quality tools and techniques including the application of statistical software for process control, Gage Repeatability and Reproducibility, Hypothesis Testing, Design of Experiments, Statistical Process Control, and Mistake Proofing to optimize and improve products and processes. Process Capability Analysis, Lean Manufacturing for waste elimination and Six Sigma initiatives for defect reduction will also be discussed.

MECHANICAL SPECIALISATION OPTION

Aircraft Mechanical Systems
This module provides students with the fundamental working knowledge of the various mechanical aircraft systems, their principal functions and design criteria, and the ability to perform basic performance analysis of certain critical components. This module covers fluid power and its actuating system, environmental control system, cabin pressurisation system, oxygen system, fuel system and four auxiliary systems onboard of the aircraft.

Aircraft Propulsion Systems
This module equips students with the basic principles of aircraft propulsion systems and a general understanding of the design features of some of the components and subsystems. Topics include gas turbine cycles, various jet and rocket propulsion systems, design features of inlets, compressors, combustion chambers, turbines and other elements of propulsion systems.

Human Factors & Aviation Legislation
This module is intended to provide an introduction to human factors and air law for students who may be working in the aviation industry. The module and assessment expand upon the syllabus items listed in the Module 9 and 10 of CAAS SAR-66 requirement. In addition to class test, the assessments also include individual reading assignments and a case study.

Integrated Real-world Project 5
This module aims to integrate the knowledge learnt in the semester and apply to a real-world project and understand the relevance and application of the modules learnt. Students will work in teams and extending the project in IRP 3 to integrate with other components to form an aircraft system at a scaled down dimension. On completion of the module, students will be able to apply their acquired skills and they analytic ability on this project.

System Modeling & Control
The module focuses on modelling the dynamics and servo systems, analysis of system responses and shaping the dynamic response through closed-loop control. Students will learn the principles of systems modelling, simulation, analysis and control, and the application of these principles in systems analysis and synthesis. Major topics include modelling single discipline and mixed systems, Laplace transform, s-plane, standard forms, time-domain specifications, effects of control actions on system performance, and frequency response analysis.

LEVEL 3.2

AVIONICS SPECIALISATION OPTION

6-Month Internship (Local/Overseas)
In this module, students will be attached to sponsoring companies or institutions for a period of approximately six months. During their internships, they will undertake projects assigned by the company / institution. Activities may be related to operations, research, project, maintenance, etc.

Final Year Project
In this module, students will work together in teams of three to design and implement a project that demonstrates their engineering skills as well as teamwork. The module is structured to encourage creativity and innovative thinking. This will also help students develop a positive work attitude and good team spirit. Students are required to demonstrate their ability and resourcefulness in implementing their selected project design solution. The scope of work includes printed circuit board fabrication, wiring, assembly and testing of the final prototype. In addition, software based projects may require database coding, operating system implementation and testing, server and client system design, portable design field test and Web-based integration.

MECHANICAL SPECIALISATION OPTION

6-Month Internship (Local/Overseas)
In this module, students will be attached to sponsoring companies or institutions for a period of approximately six months. During their internships, they will undertake projects assigned by the company / institution. Activities may be related to operations, research, project, maintenance, etc.

YEAR 3 COURSE CURRICULUM

Module Name	Credit Units
Level 3.1 (20 hours per week)	
Avionics Specialisation Option	
Aircraft Electrical & Instrumentation Systems	4
Aircraft Navigation & Surveillance Systems	5
Integrated Real-world Project 5	4
Project ID: Connecting the Dots^	4
Quality Systems & Analytics	3
Mechanical Specialisation Option	
Aircraft Mechanical Systems	3
Aircraft Propulsion Systems	3
Human Factors & Aviation Legislation	2
Integrated Real-world Project 5	4
Project ID: Connecting the Dots^	4
System Modeling & Control	4
Level 3.2 (20 hours per week)	
Avionics Specialisation Option	
6-Month Internship (Local/Overseas) OR	
Final Year Project	20
Mechanical Specialisation Option	
6-Month Internship (Local/Overseas)	20

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